

# NGSS EARLY IMPLEMENTERS

## BRINGING SCIENCE TO LIFE AS A CORE SUBJECT



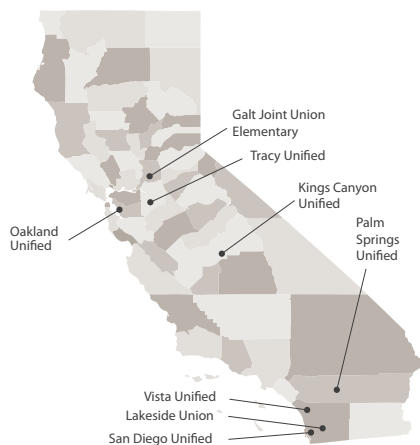
### EDUCATION PROGRAM REFLECTION



*The S. D. Bechtel, Jr. Foundation envisions a California where all youth are prepared to participate fully in the state's economy and communities, and serve as stewards of our environment. As the Foundation approaches conclusion in 2020, staff are documenting strategies from priority program portfolios. Access the series of Foundation reflections at [sdbjrfoundation.org](http://sdbjrfoundation.org).*

## INTRODUCTION

With its long-standing commitment to STEM education, the S. D. Bechtel, Jr. Foundation viewed California's 2013 adoption of Next Generation Science Standards (NGSS) as an excellent opportunity to support educators and their students as they transition to these rigorous and engaging standards. This opportunity aligned with the Foundation's overarching emphasis on supporting adult leaders as the most effective way to achieve our goal of providing students with high-quality STEM education.



The Foundation launched the six-year NGSS Early Implementers Initiative in 2014. It supports eight diverse California school districts committed to implementing NGSS in their K–8 schools. All districts are incorporating the state's preferred integrated course model for science instruction in middle school. The K–12 Alliance at WestEd, a highly respected science professional learning provider, leads the Initiative. Two charter management organizations also participate through funding provided by other sources.

The broad goal of the Initiative is to successfully support initial implementation of the science standards in a set of districts to inform state-level decisions and set the stage for statewide implementation. The experiences of the Early Implementers, as well as the tools developed through the Initiative process, are expected to make it easier for other California districts as they implement NGSS. A separate arm of WestEd thoroughly documents the Early Implementers' approaches, successes, and lessons learned in a [series of evaluation reports](#). The Foundation has invested approximately \$25 million in service of this goal.

A set of interconnected strategies underpin the Initiative:

- **Change district policies to support science education, including allocating more time to the teaching of science.** After years of responding to the unintended consequences of No Child Left Behind by prioritizing the teaching of English language arts and math over other subject areas, districts now need to recognize science as a core subject and develop district and site science plans to ensure all students are well prepared for the 21<sup>st</sup> century.

- **Build leadership among administrators and teachers.** Distributed leadership is at the heart of the Initiative. Beginning with a small, core team of administrators and teachers deeply committed to NGSS in the first year, the Initiative expanded its reach in later years to include more site administrators and teachers and scale implementation throughout a district. Administrators at all levels receive support to build their science instructional leadership. The Initiative prepares teachers to serve as leaders on three levels: in their own classrooms to implement the standards with a new pedagogy; in their schools by leading professional learning communities and advocating for being a science-focused school; and in their districts by participating in assessment, instructional materials selection, and professional learning relating to science. Teachers in Early Implementer districts also amplify their leadership by serving on state committees focused on topics including curriculum framework, instructional materials review, and assessments.
- **Change teacher pedagogy.** The Initiative supports the changes required by a pedagogy that is student-driven, three-dimensional (combining disciplinary core concepts, science and engineering practices, and crosscutting concepts), and uses phenomena-driven instruction in middle school to integrate life, physical, and earth sciences.
- **Build a science learning community.** The Initiative approach recognizes the power of learning together, placing a priority on the development of peer learning communities. Learning networks are formed within individual districts, across the eight participating districts, and between Early Implementer districts and other districts.

The Early Implementer districts have made great strides along their NGSS journeys and have developed tools ranging from classroom walkthrough protocols to NGSS-aligned learning sequences that are valuable to them and others. Even with these resources, prioritizing science to the same level as English language arts and math remains a struggle, not just in these districts, but statewide.

As of this date, science test results are not included in the California Dashboard, a reporting platform that drives many district instructional and resource allocation decisions. The NGSS Early Implementers Initiative was instrumental in prompting the state to include the California Science Test (CAST) results on the dashboard when the test is deemed valid and reliable, likely in the next few years. Given that the first statewide science test was not fielded until 2019, this Initiative does not include a student performance analysis.



Instructional materials are essential to statewide implementation of NGSS. California adopted a list of K–8 science instructional materials in late 2018; however, there is not a consensus in the field that the quality of these materials is up to the demands of NGSS. To help districts become discerning adopters of science instructional materials, the Early Implementers were actively involved in developing the Toolkit for Instructional Materials Evaluation (TIME) resource that was adopted and distributed by California’s county offices of education.

In addition to the challenges already listed, many districts face significant financial stress due to declining enrollment, pension liabilities, and special education costs. The impact of the COVID-19 pandemic will further stress education funding. California still funds education in the lowest quintile of all states. These financial constraints impede districts’ ability to provide adequate professional learning, purchase instructional materials, and attract and retain qualified science teachers.

While there is still significant work to do, much has been accomplished in these districts and it is our hope that sharing highlights of their work will be beneficial to others.

## OBSERVATIONS

Early Implementers encountered and addressed challenges, experimented with and developed effective approaches, and gained insights. Their experiences anchor this set of key takeaways offered by Foundation staff. This information can be of use to public school districts and schools as well policymakers. Much of it has relevance to charter management organizations as well.

**District leaders must articulate and continually champion science as a core subject and commit to developing, implementing, and refining a district-wide science vision and plan.**

These leaders can:

- Ensure that Local Control and Accountability Plans address professional learning and related supports (e.g., Teachers on Special Assignment/coaches) as well as adoption of instructional materials
- Increase time for science, especially at the elementary level and in three full years at middle school
- Consider policies that prohibit students leaving science class for other supports, such as English Language Development
- Develop a thoughtful plan for middle school transition to the integrated science instructional model
- Require site-level plans for science instruction
- Include regular updates to all administrators regarding the state of science education in the district



## School site leaders' commitment to science in their schools is essential.

To support the development of site leaders who champion science, district leaders can:

- Provide professional learning opportunities to help site leaders increase their knowledge and comfort with science
- Encourage principal communities of practice within the district, creating space where peers can share challenges, strategies, and lessons learned
- Require site-level plans for science instruction
- Establish a district-wide distributed leadership team to guide science implementation, with a passionate science advocate at the helm
- Enable site-based science professional learning and science-focused teacher collaboration opportunities

To build their knowledge and confidence, and demonstrate support for teachers making the transition to NGSS instruction, site leaders can:

- Participate in science classroom walk-throughs, ideally partnering with a science education expert, and develop supportive feedback for teachers to improve their NGSS practice
- Join in science professional learning with teachers
- Support collaborative lesson study as a powerful professional learning platform; it provides true hands-on learning in a classroom setting where teachers can grapple with authentic instructional issues
- Consider how site funds can be used to support teachers' science needs (e.g., materials, field trips, and science professional learning outside of what the district provides)
- Encourage use of science content to advance learning in other subject areas, with ELA as a prime opportunity for integration (the instructional practices inherent in NGSS and Common Core State Standards for English Language Arts reinforce each other); however, be sure to avoid considering science content in ELA as a substitute for experiential science learning
- Allow teachers the flexibility to try, and learn from, the substantial instructional shifts that NGSS requires
- Reach out to the larger community for support that can enrich in-school science learning activities
- Promote science through school events that include families, such as Science Fairs, Science Nights, Science Field days, etc.





**When provided with appropriate support, teachers are enthusiastic about NGSS – even when they feel their science content knowledge is not as deep as they would like.**

Several Early Implementer findings and approaches are noteworthy:

- Sustained, site-based professional learning is essential for teachers in the transition to the demands and promise of NGSS
- The Initiative provided three primary types of professional learning: collaborative lesson studies, district-supported professional learning days (PLCs), and summer institutes that spanned five days
- Science teacher leaders serve as in-house professional learning providers, PLC facilitators, and champions who keep science in the foreground

NGSS can help teachers improve *all* instruction:

- Teachers consistently remark on how engaged their students are in the NGSS classroom, including English language learners and students who participate less in other studies
- Multiple subject teachers find that NGSS reinforces student behaviors they are promoting in other content areas, such as reading for meaning, writing observations, providing evidence in support of claims or arguments, and participating in student-to-student discourse

**Environmental phenomena are a catalyst for science learning.**

Early Implementers incorporated hands-on lessons from the natural world, finding that:

- Environmental phenomena promote active learning, with strong alignment to Science and Engineering Practices as well as Environmental Principles and Concepts
- Environmental phenomena should be relevant to students' lives (e.g., a local phenomenon) and specifically address human impacts on the environment
- Environmental literacy connects to physical science as well as earth and life sciences – dispelling the misperception that it primarily aligns with earth and life sciences only



**The transition to middle school integrated science is challenging, but it remains the state’s preferred method because it is how science is experienced in the real world. High-performing countries capitalize on this learning advantage by teaching integrated science.**

Many considerations affect implementation of the integrated course model:

- It is essential to have a plan so no students lose out on essential science learning during the transition
- A coordinated model can help bridge from a discipline-specific to integrated approach; topics related to each other are placed in a sequence of learning to maximize their relationship, for example, teaching chemical reactions in chemistry helps students understand the photosynthetic process in plants
- Teachers need professional learning to support their growth in the science disciplines they have not previously taught
- Lack of access to high-quality integrated instructional materials is a major barrier to implementation

### **NGSS-aligned instructional materials are in the early days of development and refinement**

Effective teaching and learning resources are vital to large-scale, high-quality implementation. Important factors in materials development include the following:

- NGSS is significantly different from other science standards; the complexity of this pedagogy challenges the best developers of instructional materials, and national reports indicate that many currently available materials do not provide adequate NGSS-aligned instruction
- Districts need to be critical consumers of materials they adopt; consider using the California NextGen TIME [tool](#)
- District financial constraints are impeding instructional materials purchases
- Adoption of new district science texts does not remove the need for supporting teacher professional learning and collaboration; teachers must be able to adjust practice based on their students’ needs



## OUTLOOK

### Sustaining Progress

Building district capacity to support science teaching and learning over the long run is a hallmark of the NGSS Early Implementers Initiative. Forming teacher leadership teams throughout each district, coupled with nurturing the growth of site administrators as science leaders, leaves districts with a core of committed and knowledgeable champions. It would be disingenuous, however, not to acknowledge the serious challenges that Early Implementers and all districts face in prioritizing science – as noted throughout this reflection.

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### Disseminating Knowledge

A primary goal of the Initiative is to use the experiences of Early Implementer districts to influence policy decisions, both locally and at the state level. There is much to celebrate in light of this aim. Early Implementer district personnel, often in conjunction with professionals from the K–12 Alliance, have participated in many knowledge-sharing activities. Their contributions include:

- Being instrumental in the design and delivery of the statewide NGSS Roll-Outs – a comprehensive effort to provide professional learning about NGSS from awareness through implementation (Roll-Out #7 is set to launch near the date of this publication)
- Presenting to the California State Board of Education on successes and challenges of NGSS implementation
- Participating in the statewide California Partnership for Math and Science Education community of practice for science
- Developing the NextGen TIME [tool](#) in conjunction with BSCS Science Learning and Achieve; this tool changes the paradigm for how districts can review instructional materials, and Early Implementer districts provided many of the tool's trainers for districts and county offices throughout California
- Developing comprehensive learning sequences for grades K–8, which will be available on the K–12 Alliance website in fall 2020
- Writing regularly for *Classroom Science*, a newspaper developed by the California Science Teachers Association and disseminated statewide
- Presenting at many statewide and national conferences

A total of 12 [reports](#) on NGSS Early Implementers have been written to date by WestEd evaluators. These and subsequent reports will be curated on WestEd's website even past the 2020 closing of the S. D. Bechtel, Jr. Foundation.

## Advancing Related Foundation Efforts

The NGSS Early Implementers Initiative is designed to support the Foundation's Policy and Advocacy efforts to develop coherent statewide supports for standards implementation. Initiative staff works closely with the Policy and Advocacy team to communicate lessons from Early Implementers to state-level influencers. The WestEd evaluation team contributes to these efforts. In addition, the Early Implementers are active participants in the Foundation-funded California Partnership for Math and Science Education, which is building the capacity of all county offices of education and other STEM technical assistance providers.



### Learn from the NGSS Early Implementers Initiative

Access evaluation reports and resources at [wested.org/project/california-ngss-k-8-early-implementation-initiative](https://wested.org/project/california-ngss-k-8-early-implementation-initiative).

Learn more about the Foundation's investments in STEM education at [sdbjrfoundation.org/education/stem](https://sdbjrfoundation.org/education/stem).

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